Image Credit: NASA/Carla Thomas

National Aeronautics and Space Administration

Aeronautics

# Autonomous Slat-Cove Filler Device

## Reduction of aeroacoustic noise associated with the leading edge of aircraft wings

NASA's Langley Research Center developed a deployable and stowable mechanical design for filling the cavity behind the leading-edge slat (i.e., slat cove), when it is extended upon landing an aircraft. Aerodynamic flow over an unfilled cavity typically exhibits strongly unsteady behavior that is a source of aeroacoustic noise. Conventional leading-edge slat devices for high lift are a good example of such geometric and flow conditions and are a prominent source of airframe noise. Experimental and computational results have shown that a slat-cove filler device could significantly reduce the noise produced by slat structures. The proposed structural concept will enable autonomous achievement of the desired deployed shape. The design will facilitate a clean cruise configuration with minimal weight addition to the aircraft. NASA is seeking development partners and potential licensees.

## BENEFITS

- Provides significant broadband noise reduction: ~4 effective perceived noise decibels (EPNdB) reduction
- Incorporates easily into existing aircraft structure or future designs of aircraft wing structures
- Requires no additional mechanical support from pneumatic or hydraulic systems
- Constitutes low-weight addition

## APPLICATIONS

- Commercial Aerospace - Aircraft that incorporate a leading-edge, high-lift device that is distinct from the main-wing element
- Launch vehicle or rockets
- Automobiles

technology solution

## THE TECHNOLOGY

NASA Langley designed the superelastic shape memory alloy slat-cove filler to provide significant broad-band noise reduction to any aircraft wing structure that has a leading-edge, high-lift device and is distinct from the main-wing element. The design can be retrofitted to existing aircraft structures and can be easily incorporated into the existing or future designs for aircraft wing structures. The concept involves very few components, requires no additional mechanical support from pneumatic or hydraulic systems, and makes use of existing slat-actuation systems for retraction. The design is autonomous, simple, and constitutes low-weight addition. The concept is also considered fail-safe because the lift would not be diminished in the event that the slatcove filler failed to deploy.

A working version of the slat-cove filler concept is shown below in the pictures of a bench-top demonstration apparatus in figures 1 and 2. The configuration shown is relevant to a Boeing 777 aircraft and demonstrates fully autonomous retraction under manual slat articulation.

NASA Langley also offers a design for a deformable structure that is deployed from the leading edge of the main-wing element. It closes and covers the gap between the slat and the main-wing element. This approach has similar benefits as the slat-cove filler device.

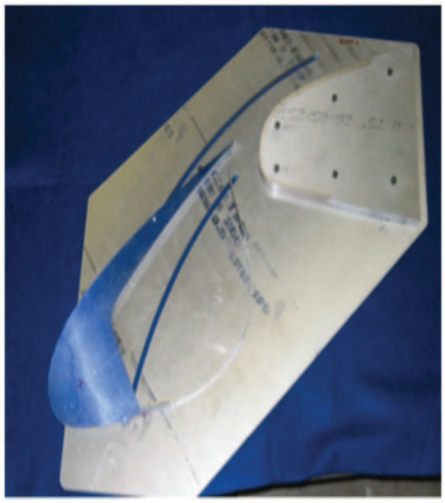

FIGURE 1 - Fully deployed

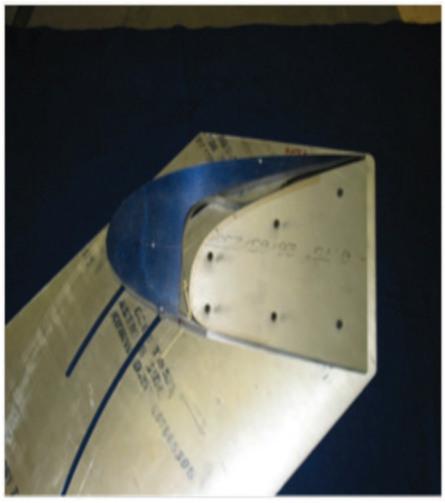

FIGURE 2 - Fully retracted

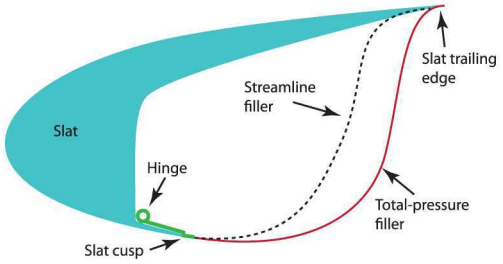


FIGURE 3 - Schematic representation of a deformable slat-cove filler

## PUBLICATIONS

Patent No: 8,763,958; 9,242,720

Patent Pending

More Information

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